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Elasticity and confabulation in schizophrenic delusions

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ABSTRACT

Background. This experiment examines two aspects of delusional cognition that have been reported clinically but not investigated empirically. These are the incorporation of potentially conflicting information into the recall of delusion-related scripts and the type and amount of material produced additional to that presented for recall, referred to here as confabulation.

Methods. Three groups of patients – deluded schizophrenics, non-deluded schizophrenics and matched non-psychiatric controls – were asked to recall two 15-item scripts, which comprised 10 typical and five atypical components. It was hypothesized that deluded subjects whose delusion was relevant to one of the scripts would recall more of the atypical components of the script and would also be less likely to make script-atypical confabulations in the recall of this particular script.

Results. Recall was assessed for the amount and type of content remembered and the amount and type of confabulation. The results did not support the hypothesis that atypical items would be incorporated into the recall of delusion-relevant material. However, deluded subjects did retain their schema boundaries in the recall of script items relevant to their own delusion but were less able to adhere to a script framework in the recall of material unrelated to their delusion.

Conclusions. These results are discussed within a schema specific account of delusions, which conceptualizes the delusion as an overused schema whose preferential use leads to a failure to develop other scripts but whose own contents remain well-defined.

INTRODUCTION

Since the publication of Oltmanns & Maher's (1988) edited book on delusions, much research activity has centred on exploring the cognitive features of delusions. However, two aspects of delusions, which have received little experimental attention, are delusional elasticity and the effect of the delusion on accuracy of memory recall.

The elasticity of delusions – the ability of the delusion to stretch to incorporate counterfactual evidence without altering the essential nature of the delusion – has been noted by a number of researchers but not studied experimentally. Joseph (1986), for example, describes how deluded individuals: 'rather than relinquishing an incorrect belief when confronted with contradictory information (…) may make further erroneous extrapolations or partially incorporate some aspects of the contradictory information within the confabulatory schema' (p. 508). Similarly, Garety (1992) details a case study on a deluded individual, Brendan, who believed that aeroplanes were following him. He was asked to note down the number of planes he saw for a week, a figure that would then be compared to the number of planes observed by his treatment team. However, Brendan refused to accept that this would be a true test of the veracity of his delusion. He argued that should the totals of planes observed be similar this would be because the pilots had changed their flightpaths accordingly. Furthermore, as Garety

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goes on to suggest, 'an answer of this sort, where the contradictory evidence is accommodated within the existing delusional belief and is not genuinely evaluated, has been found to be associated with a poor response to therapy' (p. 284). Consequently, subjects who incorporate counterfactual evidence into their delusion might be delusional longer, and have a poorer prognosis. An interesting postscript to Garety's study would have been to investigate whether in his subsequent recall of delusion-related experiences, Brendan had actually incorporated the disconcordant information. For example, it has been recorded by researchers such as Kraepelin (1886–1887: cited in Markova & Berrios, 2000) that incongruent information when presented to the subject can become part of their memory of events and become an integral part of the delusion.

The accuracy of a deluded person's recall has been an issue of some debate. McKenna (1991) argued that problems in memory were likely contributors to the formation of delusions. However, since his argument, assessment of memory function has mostly been confined to studies on patients with schizophrenia (but not necessarily on patients with delusions) and to levels of memory function rather than accuracy of recall (see McKenna *et al.* 2000, for a review). Where confabulation, 'inaccurate or false narratives' (Berrios, 2000, p. 348), has been measured, it has been concluded (Nathaniel-James & Frith, 1996) that schizophrenics do produce substantially more than matched controls when asked to recall passages of narrative. However, in addition to the fact that confabulation specifically in deluded subjects has not been assessed, a further issue needing exploration is the levels and type of confabulation produced within a delusional context. This is a particularly interesting issue because of the definitional confusion that exists between delusions and confabulation (Berrios, 2000).

A way of combining these two avenues for research – elasticity and confabulation – is through a specific memory task based on the schema plus tag theory (Bower *et al.* 1979; Graesser *et al.* 1979; Smith & Graesser, 1981) and by using materials that are either related or unrelated to a person's delusion. The schema plus tag theory allows both the elasticity of the delusion, at least as far as this is apparent in the recall of atypical items within a delusion-related script, and the levels of confabulation to be assessed. According to this theory, atypical and typical story events, when presented as part of a script (an organized package of actions for a specific event), are remembered differently. Atypical actions (i.e. actions that do not routinely form part of a given script) are tagged separately in the memory system and do not become incorporated into the schema (schema and script are used synonymously in this context). While the atypical actions are initially remembered better than schema-typical ones, the script atypical events become less accessible while the schema-typical events, because of the long-term existence and cognitive power of the script, remain accessible. Specifically, Smith & Graesser (1981) found that at a retention interval of 1 hour, memory recall was better for atypical rather than typical events but that after a week this pattern had reversed. They hypothesize that this is due to 'filtering' in that 'schemata selectively filter out "irrelevant" (atypical) information' (p. 558). The schema plus tag theory then offers the opportunity to measure deluded subjects' recall of delusion-atypical events to discover the possible propensity for incorporating disconcordant information into the recall of delusion-relevant events.

A further area of interest is to identify the levels and types of confabulation made. For example, given the script header 'making a cup of coffee' and asked to recall information, mere familiarity with the script should be sufficient for a subject to provide script-compatible recall. However, in this situation one would expect that if recall was solely based on the accessing of a script rather than actual recall then several script-compatible (or script-typical) errors of recall would be made. If access to that script was not effective then a number of schema atypical errors would be made as the appropriate script had not been activated. Previous research (Chan *et al.* 1999) has shown that the scripts of schizophrenic subjects, in comparison with matched controls, were less detailed and coherent. Consequently, the deluded group may be more likely to make more confabulations generally, as their scripts are poorly represented in their cognitive architecture.

The distinction between atypical and typical confabulations is also useful when examining

the types of confabulation made within a delusional context. A delusion is usually very well defined so it could be expected that atypical confabulations in the recall of a delusion-relevant script would be less likely, solely because the deluded person has a detailed view of, say, what finding a piece of surveillance equipment would entail. Therefore, by using specifically-designed materials, we can clarify whether confabulation occurs in the recall of scripts either irrelevant or relevant to the delusion. It should be noted that the use of material similar to the person's delusion is hypothesized to allow the re-creation of aspects of delusional cognition (i.e. cognition within a delusional context), a claim supported by the fact that different types of processing have been found in the same subjects using delusion-relevant and delusion-irrelevant material (Brennan & Hemsley, 1984; Rossell *et al.* 1998).

In this experiment, two script-based sequences were used. One (the discovery of a phone tap) was designed to be relevant to at least some patients with persecutory delusions and a control story detailed the making a cup of coffee. Regarding the recall condition, it was hypothesized that in the story in which the content was similar to the patient's delusion (in this instance the phone tap story), the deluded patients would show a different pattern of recall over the three time periods compared to deluded patients without a specific interest in the scenarios. Specifically, they would recall a greater proportion of atypical material over the three time periods, which could be seen as a reflection of their tendency to incorporate disconcordant material into their delusion. Following Garety's suggestion, the amount of atypical recall would also be associated with the chronicity of the patient's delusion. In the confabulation condition, it was hypothesized that patients with delusions would produce more confabulation than control groups and particularly more atypical confabulation. It was also hypothesized that patients with delusions irrelevant to the script would be unable to conserve the normal boundaries of the scripted story in recall and as well as more typical confabulations (errors in recall which are within the framework of the schema) there would also be more atypical confabulations (errors in recall that do not seem to fit the general script framework). However, in the delusion-relevant script it was hypothesized that subjects would show fewer examples of confabulation compared to subjects whose delusion was irrelevant to the scenarios.

METHOD

Subjects

Three groups were used in the experiment. The deluded group comprised 18 deluded subjects (two females and 16 males) who all had a diagnosis of DSM-IV (APA, 1994) schizophrenia and were delusional at the time of testing. Full details of the patients' delusions were recorded and subjects were later subdivided into those with a delusion pertinent to one of the stories and those without. Consequently, the study included nine patients for whom surveillance was implicated in their delusion and nine for whom it was not.

A non-deluded schizophrenic group was also used to form a psychotic control group and to test the specificity of the results to delusions as opposed to the schizophrenic syndrome. Although the importance of this has been noted (e.g. McKenna, 1997), it has not been widely achieved. The nine subjects in this group (two females and seven males) all had a diagnosis of DSM-IV schizophrenia but were not delusional at the time of testing or during the previous 3 months. The majority of these subjects (eight out of nine) had had delusions at an earlier stage of their illness, which is usual (Taylor *et al.* 1982).

Ten non-psychiatric controls (three females and seven male) were recruited. These subjects had no psychiatric history and were not psychology students or familiar with relevant research. A number of measures were taken from all three subject groups. These included the Beck Depressive Inventory (BDI) (Beck *et al.* 1961), a test of pre-morbid IQ, the National Adult Reading Test (NART) (Nelson, 1982), the Magical Ideation Scale (MIS) (Eckblad & Chapman, 1983), a digit span test and a test of current intellectual functioning, the Quick test (Ammons & Ammons, 1962). Details of age of onset and length of illness were also noted. All subjects in the psychiatric groups were on antipsychotic medication. Mean values for the demographic and clinical features of the groups are shown in Table 1.

Table 1. *Mean values for demographic and clinical variables*

Group	Age (years)	Age at onset	Length of illness	NART	Quick	BDI	MIS	Digit span
Deluded ($N = 18$)	29·56	21·29	8·26	25·17	36·67	11·44	13·28	6·44
Non-deluded ($N = 9$)	35·89	25·56	10·33	25·78	38·56	9·78	5·44	6·44
Control ($N = 10$)	31·6	—	—	28·2	35·5	4·7	6·3	6·8

There was a borderline significant effect of age of onset (F (1,25) = 3·77, $P = 0·06$) in the psychiatric groups but no overall group differences in age, length of illness, digit span or on performance on the NART or Quick tests. As expected there was a significant difference between the groups on the BDI (F (2,34) = 9·6, $P = 0·0005$) and on the MIS (F (2,34) = 10·15, $P = 0·0004$). A second series of analyses was carried out on the script-relevant and script-irrelevant subgroups of the deluded group. The groups were matched on all background variables except length of illness (script relevant group mean = 11·22; script irrelevant mean = 5·3 years).

Materials

Two scripts were generated (see Appendix 1), with the principles of script generation taken from Davidson (1994). One, making a cup of coffee, was designed to be a general script, familiar to most of the population. The second, finding a phone tap, was designed to be more relevant to subjects with delusions involving surveillance.

Twelve people were asked to name every action they could generate for the two script headers. As a result of this script generation, at least 10 schema typical sentences for each script were mentioned by 10 subjects. The 10 sentences chosen for inclusion in the scripts were mentioned by at least 10 subjects. Five schema atypical sentences were generated by the experimenter, with criteria for inclusion taken from Davidson (1994). Consequently, each script had 15 basic factual components. In order to make sure that the atypical events were equally atypical and the typical events equally typical, the materials were devised so that there was a clear difference in the sentences that were typical and atypical and this was confirmed statistically. It was also important for the atypicality and typicality ratings for both scripts to be similar – so the atypical events of one script were not more atypical than the atypical ones for the other script – and this was also statistically confirmed. Further details on the process of script validation can be obtained from the authors.

Procedure

Subjects, having been given the script titles and asked to listen to the two scripts, were informed that they would be tested for recall on three different occasions, – after an interval of one hour, 24 h and finally 1 week. At each recall, subjects were given the script title and then asked to give a verbal account of the story. All recall was transcribed verbatim.

The verbatim recall accounts were assessed on whether the recall featured in the story or not. A score was attained for the number of schema typical (maximum = 10) and atypical sentences (maximum = 5) that had been recalled. The other set of data concerned confabulations – material that was 'recalled' by the subjects but was not actually presented. This material was described as either schema typical or atypical. For example, if a subject erroneously recalled in the making a cup of coffee scenario that a jar of coffee was taken out of the cupboard, this was rated as a schema typical confabulation. If, however, recall contained information about listening to a radio station and singing along to the music then this was described as schema atypical as it is not related to the central theme of the story – making a cup of coffee. Simple errors in recall were not included in the data analysis. The accuracy of the recall was rated by two researchers and yielded an excellent level of agreement ($\kappa = 0·88$). The confabulations were also assessed by the raters. While there was no disagreement between the raters on whether an item either appeared or not in the original script, there were three instances where the raters

disagreed whether the insertions were schema typical or atypical. These were then excluded from the data analysis.

RESULTS

The results for recall have been transformed to allow the detection of any trends in the proportion of script typical and atypical sentences recalled over time. As the total number of schema atypical and typical sentences in each story differs, the score has been calculated in probability terms. For example, if a patient recorded five out of five atypical sentences but seven out of ten typical sentences this was recorded in the transformed data as 1 and 0·7.

Recall data

The proportion of the recall of schema typical and atypical information is shown in Table 2. As can be seen from Table 2, some expected patterns emerged such as more typical as opposed to non-typical information being recalled (F (1,1) = 10·55, $P = 0{\cdot}003$), and an overall response type × time interaction (F (2,4) = 3·74, $P = 0{\cdot}03$), indicating that schema atypical information was remembered less well at the later testing times. However, a group × time × response type interaction was not significant, indicating that the deluded group did not recall more of the atypical events over time. There were no other interactions or main effects.

It was hypothesized that patients with delusions that were relevant to the phone tap story would be more likely to remember the atypical information as it could be incorporated into their own delusional schemas. Table 3 shows the performance for the subdivided deluded group.

As can be seen from Table 3, in the phone tap story for the script-relevant group, recall of atypical information is constant, as it is for the delusion-irrelevant group. In the making a cup of coffee story, there is, at least initially, a difference in the amount of atypical information recalled by the delusion-irrelevant group, however after time period 1, this effect reduces. Although there is a borderline effect of time (F (2) = 3·26, $P = 0{\cdot}052$), not surprisingly given the pattern of results, there were no other significant main effects or interactions.

Table 2. *Mean probability recall in the two scripts*

	Typical recall*			Atypical recall*		
Script/Group	1	2	3	1	2	3
Phone tap						
Deluded ($N = 18$)	0·38	0·37	0·34	0·30	0·25	0·26
Non-deluded ($N = 9$)	0·40	0·38	0·36	0·18	0·18	0·13
Control ($N = 10$)	0·43	0·38	0·29	0·44	0·36	0·22
Making a cup of coffee						
Deluded ($N = 18$)	0·27	0·31	0·31	0·52	0·12	0·12
Non-deluded ($N = 9$)	0·32	0·31	0·29	0·27	0·16	0·13
Control ($N = 10$)	0·42	0·38	0·30	0·40	0·20	0·06

* Recall: 1, after 1 h; 2, after 24 h; 3, after 1 week.

Table 3. *Mean percentage recall in the two stories for the script-relevant and script-irrelevant groups*

	Typical*			Atypical*		
Script/Group	1	2	3	1	2	3
Phone tap						
Relevant ($N = 9$)	0·37	0·38	0·37	0·38	0·33	0·33
Irrelevant ($N = 9$)	0·40	0·36	0·32	0·22	0·18	0·18
Making a cup of coffee						
Relevant ($N = 9$)	0·30	0·33	0·28	0·25	0·22	0·16
Irrelevant ($N = 9$)	0·28	0·28	0·29	0·67	0·13	0·13

* Recall: 1, after 1 h; 2, after 24 h; 3, after 1 week.

Table 4. *Mean number of confabulations in the two scripts*

	Typical*			Atypical*		
Script/Group	1	2	3	1	2	3
Phone tap						
Deluded ($N = 18$)	0·89	1·10	1·30	0·22	0·11	0·33
Non-deluded ($N = 9$)	0·44	0·56	0·56	0	0·11	0
Control ($N = 10$)	0·60	0·50	0·50	0·10	0	0
Making a cup of coffee						
Deluded ($N = 18$)	1·17	0·94	1	1	1·17	1·50
Non-deluded ($N = 9$)	0·78	0·56	0·67	0·11	0	0·11
Control ($N = 10$)	0·90	1·10	1	0	0	0

* Recall: 1, after 1 h; 2, after 24 h; 3, after 1 week.

Confabulation data

The other area of interest in this experiment was the number and pattern of confabulations. Table

Table 5. *Mean number of confabulations for the script-relevant and script-irrelevant groups for the two scripts*

	Typical*			Atypical*		
Script/Group	1	2	3	1	2	3
Phone tap						
Relevant ($N = 9$)	1·00	1·22	1·89	0	0·11	0·11
Irrelevant ($N = 9$)	0·78	1	0·78	0·44	0·11	0·56
Making a cup of coffee						
Relevant ($N = 9$)	1·89	1·67	1·44	0·89	1·67	2·56
Irrelevant ($N = 9$)	0·44	0·22	0·56	1·10	0·67	0·44

* Recall: 1, after 1 h; 2, after 24 h; 3, after 1 week.

4 shows the mean number of confabulations per group. The number of typical confabulations across scripts in all groups tends to stay constant, although it appears to be higher for the deluded group as opposed to the other three. However, regarding the atypical confabulations, these tend to be made almost exclusively by the deluded group. The two stories were combined in a mixed ANOVA with one between group factor and three within factors. There was a significant effect of group (F (2,34) = 8·99, $P = 0·0007$), indicating that the three groups differed in their confabulation levels and *post hoc* testing revealed that this was due to the elevated scores in the deluded group. There was a significant effect of response type (F(1,2) = 16·06, $P = 0·0003$), with more typical as opposed to atypical confabulations recorded. A significant interaction between story × response type × group (F (2,34) = 5·25, $P = 0·01$) indicated that the groups made different amounts of either atypical or typical confabulations depending on the story type, probably due to the inclusion of script-relevant material for half the deluded group. No group × response type interaction was found.

A final analysis of interest was a comparison between the performance of the delusion relevant and delusion irrelevant groups on their confabulation levels. The results are shown in Table 5. It can be seen relatively clearly from the results that compared to the script-irrelevant group, the script-relevant group produced fewer confabulations in the phone tap story (in other words in the script which had specific relevance for them) than in the coffee story. This is confirmed statistically by a significant story × delusion type interaction (F(1,16) = 12·64, $P =$ 0·003). There was also a significant story × response type × time × delusion type interaction (F (2,32) = 13·67, $P = 0·0001$), which indicates the different groups' tendencies for the atypical confabulations, particularly in the coffee scenario, to increase or decrease over time.

DISCUSSION

In the recall condition, there was no difference between the amount or type of information remembered by the deluded and other groups generally. For the subdivided deluded group, the experimental hypothesis suggesting that the deluded subjects for whom the phone tap story was relevant would incorporate more of the atypical information over time was also not supported, as indicated by the lack of a story × delusion type × response type × time interaction. Consequently, no correlation analyses were carried out comparing length of illness with atypical recall.

Perhaps, on reflection, this result is not surprising. It could be that the delusional subjects for whom the scenario was relevant did not feel the need to incorporate the script-atypical information into their delusion and thus cause different patterns of recall. In Garety's (1992) example, Brendan had to incorporate delusion-incongruent information into his delusional schema to safeguard the validity of the delusion from the threat of falsification. It was not an automatic process. In this respect, the experimental design could be seen to be an inadequate attempt to replicate a feature of delusional cognition – the incorporation of delusion incongruent information – which occurs from a much deeper level of processing then merely being asked to remember facts. This is clearly an issue which would need to be addressed in future research.

Regarding the experiment's second area of investigation, levels and types of confabulation, it was found that subjects with delusions confabulated to a much greater degree than the non-deluded and non-psychiatric control groups as indicated by the main effect of group. Importantly, this is not because of general problems in recall, as indicated by the lack of a main effect of group in the recall task. Furthermore, the group × response type × story interaction (the story component of the interaction

is likely to have occurred because of the script-irrelevant material used for half of the deluded group) indicates that the deluded group even in their confabulations did not adhere to normal schema boundaries. Examine, for example, this account from deluded patient K. S. at the third test time in the cup of coffee story.

Sue woke up early one morning and put the kettle on to make a cup of coffee. She opened the curtains of the verandah and opened the verandah doors. In walks her cat. She took the top off the bottle of milk and poured out the coffee and poured cream into the cup. She bent down and gave cream to the cat. She relaxed and had a cup of coffee and the cat enjoyed his milk.

Although K. S.'s recall makes perfect sense, it bears little relation to the actual script and is rich in schema atypical confabulations. Whereas the whole focus of the actual script targeted for recall is making a cup of coffee, K. S. has picked up on one schema atypical aspect of the story and elaborated around it. He has not conformed to the normal script framework.

In the subdivided deluded groups, both script-relevant and script-irrelevant groups showed a clear difference in the type of story needed to evoke atypical confabulations. For the script-relevant group the number of atypical confabulations was very low in the phone tap story – the story on which they were hypothesized to resist script-atypical intrusions. However, it is evident from their performance on the coffee story that this was not due to a general tendency not to make atypical confabulations. Perhaps this is because the delusion itself in some way resembles a schema. In normal cognition we know that schemas are relatively well-constructed (Marshall, 1995) and delineated and while not completely resistant to modification do not change after exposure to a few counter-examples. By comparing the delusion to a schema it could be argued that this explains why atypical events are not easily subsumed into the delusion and also how delusion-related recall is protected from atypical confabulation.

The main result from this study has been that deluded subjects, as indicated by their confabulation levels, have more difficulties than controls in recalling accurately scripts unrelated to their delusions. However, they have a reasonably well-defined and established delusional schema that is able to resist atypical intrusions. In relating these findings to other theoretical positions, the first conclusion is similar to the arguments espoused by Hemsley and colleagues in explaining schizophrenic symptoms as a 'weakening of the influences of stored memories of regularities of previous input on current perception' (Hemsley, 1994, p. 97). While expressed in slightly different language, one of the obvious correlates of this theoretical position, and one confirmed by this study, is that where recall in deluded subjects is in some way dependent on script familiarity, this would be impaired. However, the second part of this study's conclusion, that the delusion acts as a powerful construct in its own right, is similar to a theoretical position espoused by Magaro (1980). He argues that the deluded individual's cognition is dominated by one or several schemas (or delusions) that determine or influence the interpretation of incoming stimuli. Using this formulation, it is possible to understand why a delusion would inhibit confabulation in delusion-related recall.

Finally, the relevance of this experiment to our wider understanding of schizophrenic delusions needs to be discussed. The cognitive implications of this experiment support the idea that a delusion can be described as a frequently accessed and well-developed knowledge structure. As well as exerting a directing force on incoming data, the knowledge structure can also reconfigure events in long-term memory and influence material available for recall. This would also suggest that incoming data, which cannot be interpreted by the dominant delusionary schema may be interpreted without a theoretical framework and interpretation could consequently seem random or illogical. This type of definition is also interesting in that it avoids philosophical questions concerning the nature of a delusion as a 'wrong belief' (Berrios, 1991) and posits it as knowledge structure that engenders conviction through its frequent activation (Hasher *et al.* 1977).

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APPENDIX

The discovery of a phone tap

Patrick went to make a phone call.
He noticed the phone was covered in dust. (Atypical)
He put the receiver to his ear.
He started to dial.
He heard a strange clicking noise.
He scratched his ear. (Atypical)
He unscrewed the handset.
Finding nothing he took apart the console.
He hurt his fingers as he pulled it apart. (Atypical)
He saw a small strange-looking electronic device.
He took it out carefully.
It dropped through his fingers and he had to pick it up off the floor. (Atypical)
He looked around the house, examining other electrical appliances.
He peered out of his curtains looking outside his house.
He noticed his curtains were dirty. (Atypical)
He made a note of the number plate of the van outside his house.

Making a cup of coffee

Susan put the water in the kettle.
She looked out of the window into her garden. (Atypical)
She plugged the kettle in.
She got out her usual cup.
It was from her aunt in the Isle of Wight. (Atypical)
She put the coffee in the cup.
She added the boiling water.
She adjusted her glasses. (Atypical)
She took the milk from the fridge and poured some in.
She put in the sugar.
Her cat came in and miaowed. (Atypical)
She took out another teaspoon from her drawer.
Her arm started to itch. (Atypical)
She stirred the coffee.
She took a sip.

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